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The CHEMIST

JANUARY, 1940 VOLUME XVII, No. 1

THE SELECTION AND TRAINING OF EXECUTIVES FOR THE CHEMICAL INDUSTRY

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THE YOUNG CHEMIST AND THE GOVERNMENT SERVICE

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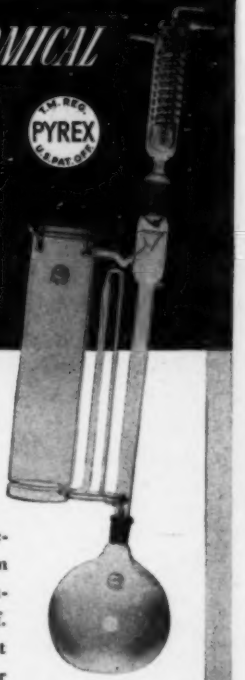

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The CHEMIST

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The Eighteenth Annual Meeting of The American Institute of Chemists

"If Winter comes, can Spring be far behind?"—Keats.

THE eighteenth annual meeting of the AMERICAN INSTITUTE OF CHEMISTS will be held at The Hotel Claridge, Atlantic City, New Jersey, on Saturday, May 18, 1940.

Complete reports of the year's activities will be presented by the Committees and Chapters. The annual medal award of the Institute for "noteworthy and outstanding service to the science of chemistry or the profession of chemist in America" will be presented to a recipient to be announced later.

Speakers during the afternoon session and a complete program will appear in THE CHEMIST as soon as details are arranged.

Preferential Reëmployment Register

The U. S. Department of Agriculture has adopted a policy of placing employees who have been discharged for lack of funds and without prejudice on a preferential reëmployment register for a period of one year.

This is one of the recommendations made by THE AMERICAN INSTITUTE OF CHEMISTS to the Reed Committee for Civil Service Improvement. (See page 395, December, 1939, CHEMIST.)

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The Selection and Training of Executives for the Chemical Industry

By **W. S. Landis**

Vice President, American Cyanamid Co.

A talk given at the January nineteenth meeting of the New York Chapter.

IN THE recent past there has been much publicity based on the false idea that modern corporate management had failed in its general obligations to the welfare of the Nation. Most of the criticism was of political origin, some from academic circles, though neither group had the slightest experience, or acquaintance with the subject. Far too much of the criticism had its origin in the *Communist Manifesto* of Karl Marx, and simply selected business management as the whipping boy, furnishing thereby a pretext for a subversive propaganda to stir up class strife, with the ultimate aim of destroying our democratic form of government. It is an exact execution of the Marx strategy just as the author himself designed it. Those who, whether they knew it or not, were serving as his agents, have been apt. They have penetrated high places. They have followed the program first outlined by Marx himself. And they have done a lot of harm that will take years for recovery.

In recent years, decree and law carrying out the doctrinal principles of Marx have followed in an almost unending stream. All this has greatly complicated the problem of efficient business management. Very few signs of abatement of this subversive flow are yet in sight, and in consequence corporate management has ahead of it a still more difficult future. Not only are we facing the so-called normal hazards of business, but in addition we must combat a distinctively new, for us, form of destructive agency. May I emphasize that these are not too emphatic statements.

It, therefore, is proper that here and now we should give serious attention to the development of that personnel that must bear the grave burden of carrying on business—the life blood of this nation today—in the face of the destructive political attack. This nation is built on a foundation of industry. While it may have started on an

agricultural basis it would never have passed the standards of Mexico, Southeastern Europe, even China, had not industry also developed to exchange its products with agriculture. No one gives a second thought to disputing that we are foremost in industrial development. No one disputes that we have the highest standard of living in the world, measure it by balance of food, number of water taps in the house, bath tubs, automobiles, telephones, central heating plants, radios, in fact anything adding to comfort.

Yet even these standards vary widely in the different states. They are higher in Connecticut and Massachussetts, both industrialized states, then they are in Mississippi or Arkansas. On the average, we know our standards are better than those of China or India. Industry, that means business—corporation—manufacturing, is the great foundation of it all. The better and more efficiently we operate that business, the more it will raise the standard of living of all who care to participate.

We are all professional men here, and accustomed to looking at facts fairly and honestly. If they are not apparent, we will go to all sorts of trouble to dig them out. We know how to use our professional perspective to appraise our data. We all know there has been a rather goodly share of business that has been efficiently and effectively managed. There has been some—much too much—that does not have quite so good a record. And there is a smaller third group that has been managed badly or worse. In this treatment, management includes conception.

Now while the law makes the corporation impersonal, we know that its management, that which makes the wheels turn, is a purely personal direction, by people like you and me. They represent all grades of intelligence, of education, of experience, of activity. We all recognize capability and limitation as an individual characteristic, and it will be ever thus.

Now some business units have been set up, be it accidental or intentional, on such a foundation of conservative financing, engineering, adequate production, skillful distribution, that the unit can take considerable manhandling from a casual executive and still survive. Another unit badly conceived and organized could not be saved by *Allah* himself. You all know of buildings of equal engineering perfection, of essentially equal materials and construction, the one filled and profitable, the other not covering carrying charges. Some omission in consideration, in judgment, is the only material difference.

and this usually in the intangibles that must be considered in any project. It shall be our problem here to supply that missing something.

I shall here define an executive rather broadly as anyone who exercises judgment and decision in the determination of methods, selection of means, and establishment of the program of business. He may be a straw-boss, or a chairman of the board with a multitude of assistants. He is in no sense a wholly free agent, for his fields of operations may be circumscribed by legislation, by decree, by charter, by established principles of common law and rights of others, by experience, and by environment. Further his own personal characteristics should temper his exercise of authority, such as education, training, and physical strength, for example.

Where have our executives come from? Accident will always play some part in the selection, but that is too involved a subject to be dealt with here, and is of relatively minor importance today. Family succession is another source. It may be good or bad. Many sons, given proper and adequate training have carried on very successfully. Others lacking these perquisites, have been outstanding failures. With a proper background, family succession is an excellent source of material; with a selfish or obstinate purpose it is a most evil source, and one difficult to correct. One of the best indicators of the effectiveness of an executive is how this particular problem is handled.

In past times, the banker and the lawyer classes have taken the lion's share of the upper executive positions. I have no brief for or against either group, for I know excellent individual material in both groups who are entirely capable of successful management, but that has little bearing on our approach to our problem here, which directs its attention to the particular fitness of the group as a whole to serve as the reservoir from which to draw our major executives.

The larger corporations are very complex organizations. They are like intricate machines intended to perform a series of different yet synchronized operations. In the corporation we have many activities of different kind, financial to provide capital to build and operate, engineering to supply tools; operations to set these tools in motion, to see that they are serviced with the right personnel, and that they make the specified products; sales to distribute the products; accounting and record activities; legal activities to protect property rights, and a host of further subdivisions. Now like our machine, all ultimately head back to the main drive, otherwise synchronism is lost, gears clash, plungers interfere and the machine is wrecked. It is

just so with the corporation, there must be that main drive, irrespective of the number of secondary units taking off. The efficiency of operation of our corporation is measured very largely by the top executive. Without such effective head we have Soviet management and that never has and never will operate efficiently.

Further, we all recognize the division of responsibility in such organization. It must be organized in departments, and again in departments, and still again, each headed by some executive of some degree of authority. But the struggle for power, for recognition, for a place in the light, is always an incentive to over-building, to waste, to unbalancing. Each executive above must be familiar with enough of the details of the lower strata to recognize such evils and to balance the units. This carries through to the top of the organization. An executive must have the knowledge and experience to keep his machine in balance and in synchronism. Otherwise there is inefficiency and waste.

Let us return to our banker and lawyer groups who not so long ago furnished a large percentage of the top executives. Is there anything special in the training and education of these groups which particularly fits them for management? First, there is a place for each in our corporation. We have financial problems and we have plenty of legal tasks. Both divisions need the executive direction, of these specific types. But after all, the usual corporation is a producing and selling unit—steel, automobiles, food products, chemicals. The financial and the legal phases are relatively secondary to the main purpose. Capital funds flow to industry because their utilization in tools for production and in the operations yields a somewhat better return, if properly managed, than if invested in government bonds or deposited in savings banks. The industrial phase, not the banking phase, controls.

Similarly production is the prime purpose of industry, and legal service is required as an auxiliary to see that we hold our rights, collect our bills, and return our just dues to the Government. We do not legislate a process out of the laboratory, or sue it through the operating unit. A court decree will not make a reaction run up hill against a free energy equation. I thus put the very necessary legal division in a secondary class to our main motive.

Now the banker is trained on money and credits. We use both only in the form of tools or materials. Our capital goes for buildings, for equipment, and for working capital. The efficient expenditure

for such purposes is of great moment. This spending is outside the immediate ken of the banker. He is usually not familiar with costs, with adequacy of design, with sales and distribution of goods which control working capital needs. He is wholly dependent on someone else's opinion and recommendation with no first-hand ability to appraise. The rivalry of departments may make for gross extravagance and waste. Errors in appraisal based on too narrow vision may be very expensive. Such must be reviewed by competent superiors, even to the top of the organization in the case of major items.

But business is always in the unknown. It thrives on discoveries, on new products, new uses, new services, and has to go out and develop them to live and expand. Certain professional groups are enormously handicapped in our industrial executive field. They have no background of industrial education and experience; their training and education have a reverse spin, which is a great handicap to progress in our arena.

Remember we are referring here to groups not to individuals. The individual may always possess the capability, and particularly the industry to overcome these obstacles of early training, and by long hours and assiduous application he may fit himself to such a position as is here discussed. Many a good bricklayer has been spoiled by trying to make an engineer out of him, and the reverse can just as readily happen. Anyway we are idealists and we are dealing with this argument from such a point of view. It is not just "getting by" that I am treating here, but an attempt to arrive at the best and most efficient solution. I am striving for the perfect ideal, not a mere passing mark. The run of pile may show a six to four record and survive, but how much better would be an eight to two, or a nine to one.

Every business failure, every capital loss stirs up our Marxists. They do not recognize that catastrophe, *force majeure,* vicious legislation, punitive taxation, over which business has little or no control, may be a fundamental cause of some venture going sour. But has management done all possible to make for highest efficiency; has it exerted effective influence to mitigate the effects of some of the extraneous troubles just enumerated? I am sorry to say I can find inefficiency, and some can be traced to inadequately trained personnel. We can still make it more efficient by giving better training and education to those who will take it over. And where should we look for our executives?

There is only one logical source of any executive material in any institution. That is through promotion based on merit and performance. Every well-managed corporation should possess a capable subordinate in each of its units, ready to perform in the position above himself. And the corporation should lean over backward to make such advancement, and render the maximum of assistance in making the new unit produce the best result. Any other source of personnel is likely to be less efficient, and may engender much discouragement to the younger employees, as well as be quite costly.

In our particular problem here we are concerning ourselves with relatively minor executives, those nearer the straw-boss end of our series. Once set on the lower rung of the ladder, it is up to the individual to merit the advance, to find his top. That progression over and above the start is not dealt with here. Even following the pattern of start I am outlining, our candidate will meet with plenty of competition with those already in the organization, in fact with those that enter through other doors. More than that he will find many avenues of advancement open in which he will have little or no specific advantages. In short, I shall deal more or less theoretically with a specially selected group, which shall serve as an emergency reservoir from which may be drawn men of relatively broad experience to fit into certain types of work that through competitive promotions may lead to minor executive positions difficult to fill otherwise. From there on it is a free-for-all.

I believe that future executives will come generally from those groups with engineering training. While such can be acquired by experience, home study, correspondence, tutoring, much time is saved by the college or technical school. A graduate in engineering of a large, well-equipped, and rigidly controlled school has a tremendous time advantage. Here he receives a fundamental education in the general sciences, the fundamentals of construction and general engineering for two or three years—say at least fifty per cent of his course. The other fifty per cent should be divided into twenty per cent of cultural work and thirty per cent of specific topics in the specialized field in which he desires to serve after graduation. I feel that in the not distant future such education will not be attempted in four years, but emphasis will be laid on more of the general education, and the specialized engineering work will demand additional years; the six year course would be better.

Nor do I feel these additional years should involve post-graduate

type of work as now understood; that is too specialized for our particular purpose. I would like to see a broader, extensive education rather than intensive for this particular purpose. I should devote more time to English—composition, spelling, speaking; to economics —general accounting, labor relationship, psychology, even industrial history. These subjects should be taught by engineers, not with the idea of making specialists in these fields, but for acquaintanceship with their daily applications. Engineering English is as different from classical English as day is from night. It has no place for fiction, mystery or space writing. It is a distinctive branch, and should so be taught by competent and experienced instructors. Classical economics are excellent for the future economist, but for the future executive, a more direct application of the basic principles is a better approach. These future executives are going to deal with people. Human relationship and the psychology of team work are extremely important. In fact so much so that I believe in more selection by the school itself, so that valuable plant and staff are not wasted on turning out so many misfits.

The specific branch of engineering studied is not an all-determining factor in the selection of a man for a future job. I think a prospective chemical executive should know some chemistry; and an electrical executive some electricity, but this is not always a determining factor. The broader we make our engineering courses the less this problem of selection of course of study becomes.

The college should not attempt to turn out a finished product in the shape of a chief engineer, factory superintendent, or even a vice president. This involves too much specialization which would probably not fit with any existing organization. In this particular field we need not concern ourselves with post-graduates. Post-graduate work is too highly specialized in most of the colleges with which I am familiar, and the time spent is probably not warranted, in my opinion, in our selection of the raw material for future executive work. I am in favor of post-graduate work for places in many of the specific technical lines, but I do not consider it essential for the material that we are considering to develop into some sort of an executive. If our future candidate can afford the time and money for further education, it should be in the humanities, and in the broader field of the regular classroom, not in post-graduate schools.

At this stage in my presentation, I have reached the conclusion that the youngster intending to enter the chemical industry and with the

intention of going somewhere in it, should have an engineering education, preferably with a considerable knowledge of chemistry, and naturally, though not absolutely necessary a chemical engineering training. I am not unaware of the fact that many schools give considerable chemical education to all classes of engineers. I am not unaware that many chemical plants spend a great deal of money for power, steam, electricity, water, and for handling materials; and that mechanical, electrical, and maintenance departments measure up with the chemical units in size and cost. In distribution the service men get into all kinds of industry, some of our best customers not necessarily operating a chemical plant in its narrow sense, at all. Hence I say, some chemistry, but not too much at the expense of the broad fundamental engineering.

The problem of selection of these employees who may some day be in important executive positions is not easy. Any man who has any hesitation in attacking any job that may be assigned to him immediately creates a handicap. In the case of the college graduate, he has spent years and money in obtaining an education, and he deserves a wage in keeping with his investment. He may indicate a preference for the type of work he is seeking, but from my standpoint that is often a definite limitation. Once the wage is set, and on a fair basis, he must be willing to serve in any capacity assigned, no matter how humble. He should be openly told the program ahead of him, the services expected of him, and the relatively nearby rewards, if he passes the test. Actually at this stage of his career he knows little of industrial work, and any conclusions on his part are rarely well based. He must be educated in his new environment.

I prefer to lay more stress on personality than on scholarship. I want a man who has done something better than to have been barely graduated, but it is really not necessary that he be an honor man. If I can get such an honor man with the right personality, so much the better. Now this matter of personality is hard to appreciate in the usual course of a short interview. If a man seems to possess some possibilities, I would take him on and put him in a training course in one of the plants, where he is put to work at any convenient job that brings him into contact with fellow workmen. He may be assigned as helper on a process, on a maintenance gang, even with the yard and shipping crews. The object of this is to see if he can get along with his fellowmen, if he has the right attitude toward the job, that is any job. He should be kept on such work at least three months.

Every few weeks he should be called up before a plant executive and given a quiz, either written or oral to see what he has learned. At the same time, reports are requested from his immediate bosses, regarding his relationship with his fellow worker, who may be a common laborer. If he can not get along with his co-workers, he will never become an effective supervisor, executive or salesman, all of whose contacts are more with the human element than with any apparatus.

All of which brings us to the subject of the training course. I favor a system of operating two separate courses. One we shall call the cadet course (distinctive name only) and it should be operated by the plant, for providing future operating material. These are the men who may expect to go into operations and through this channel progress to the higher positions. Some men prefer operating work, they like its activity, its romance of handling machines, materials, and men. They abhor desk work, or at this stage think they do. They are usually the husky outdoor type, have a good physique, and are frequently athletic.

Then there is the other training course, let us call it the student course. This is designed to train for the general office and its myriad of departments which prefer technical men for engineering, technical service, sales, and the like. This group also is assigned to the plant, as is the cadet course, but it is made plain to them that they too are on probation and at the end of a short period, three months is usually long enough, a determination will be made as to their future assignment.

So that such a system may function, it is well to have the student training course on a separate payroll. If it is on the plant roll, there is a tendency toward too efficient utilization of the men as routine employees and to keep them on specialized tasks in which they may become quite skilled. It is better to secure freedom of assignment and progression by using a general office payroll.

At the end of three or four months, we have a rather fair idea of the raw material selected. We must then make the decision to carry on in this specific training course, to make transfer, or to eliminate. Some men show better adaptability to operating work at this point and should be shifted to the cadet course at the plant. Some show inherent chemical ability, but poor contact ability. They might go to the laboratory, for research or control work. Some are inevitably out of place and should be released. This latter choice is the most abused,

for one usually hesitates to release a man, attempting to fit him into a position perhaps for years. This is a great mistake, and harms both the man and the institution. I could cite a large number of unfortunate cases which are the result of just such hesitation.

Once the decision is made to retain a man, he should go into the plant office for a month, and for a similar time into the control laboratory. We are endeavoring to familiarize this man with the work of the company, and the only way to do so is by actual contact. He must learn something about how products are produced, how specifications are met, how orders are handled, and how records are kept.

Six months of this type of training is about all that is needed for our student course. We then transfer our student to the service laboratories. Here he comes in contact with the products of the Company by groups, their applications and the service problems that come in from the field. We try to keep him for a year at this work, moving him from group to group. If he seems a likely candidate for the sales office and shows special aptitude in a particular field, he may even specialize in that division at the expense of other groups. His salary is still on a general payroll, so there is no drive to put him at laboratory routine and keep him on a particular job too long. Constant supervision is required all through the work to prevent his landing in a blind alley because there is a jam in some division, or because the laboratories may be short handed at the time.

The next move is to the general office where he is assigned to clerical work. This is usually in a sales unit, later in credit and billing. We aim to teach him how an order gets from the field to the plant, how the product is shipped and the bill paid, for this is all that keeps the entire machine turning over. There are a lot of auxiliary mechanisms of which he has not seen nor heard, but as in the automobile, the clock can stop, the cigar lighter not operate, the heater be dead, yet we can still move if the engine and transmission function. So with the corporation, stop production and sales, and it soon dies, irrespective of how effective some of the secondary service divisions are. We aim in two years to cover mainly this field of production and sales.

Then comes the problem of ultimate disposition of these candidates who now have some general idea of the business. Naturally the sales group get most of them when the course is finished, for this particular group was intended to provide a direct source of raw material for the general office, though not the only one. But along the

line, the factory and the laboratory may have taken their toll. It is difficult to synchronize the school with the actual development of openings in any particular division. This looks like an apparently insoluble problem today, but when we finally get enough of today's students in responsible places in the several divisions, it will not then be so difficult. To date in our four years experience it has been a relatively minor problem. Our difficulties arise in the opposite direction. These men are carefully selected. They are tried out in a hard school, and have proven their mettle. In consequence the school is called upon for men before training is completed.

To summarize, we are attempting to train men for future executive positions of responsibility to which they are expected to move as openings occur. The training units both may lead to the same goal, but by different routes. The courses should be quite independent of any routine operating division. We choose men with considerable chemical training, and we prefer that the great majority be graduates in chemical engineering of an accredited institution. Our experience with graduates in business administration or industrial engineering is not quite so satisfactory as with the engineer, and we accordingly give preference to the latter for this particular group, though this is not absolute.

Selection of the student group is made by an executive officer. If left to plant management they unconsciously lean to operative types; if to laboratory, toward research worker types. This is most important. The students should go on a general payroll, irrespective of assignment. Their cost must not affect plant or laboratory sheets directly.

Constant supervision is necessary to keep them in motion through the prescribed program of training. There is great temptation to put them on production, or to throw them into some routine service where a division has gotten itself into a jam. This supervision must determine aptitude as quickly as possible, and eliminate the misplaced units. They may be adjusted sometimes by transfer and replacement. Once they have lost the confidence of the plant manager or laboratory director they must be shifted or released.

Resistance to premature transfer to the general office or to operating departments must be firm, but it cannot be too rigid. After all, such positions are looked upon by the candidate as promotion, and one must not discourage him by too strong objection. The reverse

may also occur readily with men ready for transfer and no immediate place available. These men must be taught self-restraint and patience.

Perhaps ten years from now, I might give a better report of performance. We are still struggling with methods of perfecting the mechanism. Imperfect selection has diverted men in a direction not intended, or has resulted in having men ready for advancement, yet not entirely suited to the particular opening available. Far worse has been the emergency opening wanting men quickly, and the roster of the student or cadet courses offering no men who have completed the prescribed training courses. But this is a new project. Its candidates are only in minor places, competing against the staff of experienced employees who have long been in service. As I said, the answer may not be learned for ten or twenty years yet, when the race has progressed to the last laps. These men get no preferences and will always have to compete with all others for the place. The system has proven its value in many ways, and has not been expensive. It has given excellent service in many emergencies.

The Young Chemist and the Government Service

***By* Louis Marshall, F.A.I.C.**

The tenth of a series of articles on the opportunities for chemists in the government service

Bureau of Animal Industry

ONE of the largest scientific agencies within the Department of Agriculture is the Bureau of Animal Industry. As its name implies, it is concerned primarily with the protection and development of the livestock and meat industries of the United States. Besides conducting scientific investigations into the causes, the cure, and the prevention of the diseases of domestic animals, the Bureau does a vast amount of inspection work in enforcing the Federal livestock laws. This inspection work is done by veterinarians of whom quite a few hundred are employed by the Bureau. They are stationed in cities throughout the United States and in one year they inspected nearly 62,000,000 animals and their products. The fact that certain serious animal maladies such as foot and mouth disease, which are taking such a heavy toll in foreign countries, have

not made their appearance here, attests the effectiveness of the quarantine measures of this organization. The benefits to the consumer of these services is well established. Today, meat from diseased animals seldom reaches the American dinner table, and the consumer has a justified confidence in a meat product which bears the label: "U. S. Inspected and Passed by the Department of Agriculture." Federal specifications governing the purchase of meat and meat products stipulate that they shall be prepared under the supervision of the Bureau of Animal Industry, and they must be so marked.

The early events leading up to the establishment of the Bureau of Animal Industry are worth recording. The importation into this country in 1843 of a cow suffering from contagious pleuropneumonia caused the spread of the malady to other herds. The disease slowly but surely gained headway, appearing first in New York, then New Jersey, then Massachusetts, Connecticut, and Delaware. By 1879, the disease was threatening the already enormous livestock industry of the nation. It became difficult to sell American cattle to foreign buyers. At this juncture, the livestock men demanded Federal action to control the disease before it became forever uncontrollable. With this dreaded prospect before the nation, a bill was introduced in Congress in 1884 to establish the Bureau of Animal Industry. The act had many opponents who, even at that time, trotted out the old bogey of infringement of states' rights in their efforts to secure its defeat. But the grim realization that the causal agents of disease do not recognize the border lines of states, led to the adoption of the measure, and within five years the scientific workers of the Bureau succeeded in eradicating the disease which since that time has never been able to gain a foothold within these shores.

The chemistry work of the Bureau is carried out principally by the biochemic division working in close coöperation with the other divisions.

In the past, its work dealt with such problems as the determination of the composition and properties of all kinds of meat, eggs, wool, and bones. The nutritive value and vitamin content of different parts of the animal carcass were studied. Also, of particular importance to the industry, the effects of storage of meats upon their chemical properties were studied, as was the determination of the chemical changes which take place in the process of rancidity. Its recent work has dealt with the chemistry involved in a study of hog-cholera, dips, disinfectants, antiseptics, and those biological preparations used in the

diagnosis of animal diseases. Part of this work involves researches into the relationship between chemical structure and parasiticidal power.

As an example of its work in the field of hog-cholera investigation, the Division solved a troublesome problem with the discovery that the bottles used for the distribution of the hog-cholera virus yielded soluble alkali which was deleterious to the product. The Division then recommended to the trade the use of a more resistant glass which does not contaminate the virus with alkali. Work is being carried out to determine the efficacy of a certain vaccine against hog-cholera. This vaccine consists of a mixture of defibrinated blood and crystal violet to which phenol or cresol or disodium phosphate is added to prevent contamination by foreign organisms. The vaccine was injected subcutaneously into one hundred and fifty two pigs, and their immunity determined by the subsequent injection of one cc. of virulent virus blood. After this treatment, it was found that one hundred and thirty one of the pigs remained well, seventeen showed a slight indisposition followed by a recovery within a day or two, and in only four cases were there severe reactions, though none of the pigs died. Thus the percentage of protection against hog-cholera given by the vaccine is about one hundred. It has been observed, however, that the age of the pigs at the time of vaccination is an important factor in the retention of immunity. In a study of the complex reactions of immunization, it is necessary to realize that all of the factors involved in a specific vaccination may not have been correctly evaluated; and indeed, one or more may not have been recognized. The experiment also showed that the pigs required about fourteen days after vaccination to establish immunity.

The Division is carrying out a great deal of research work on dips and disinfectants which are employed to rid livestock of insect pests and bacteria. The inspectors of the Bureau are provided with supplies for making field tests of arsenical dipping baths, lime sulphur dipping baths, and nicotine dipping baths. In one year, more than one-half million such tests were made. Research work is also conducted on anthelmintics, used as remedies for the removal of worms from the intestinal tract. In the study of anthelmintics, two new lines of research were begun, one concerning the effectiveness of dyes of varied structure against tapeworms in chickens, and the other, the efficiency of chlorinated hydrocarbons for killing ascarid and strongyle eggs and larvae in horse manure. Ascarids are a family

of worms which include several genera of pinworms, roundworms, and other intestinal parasites. Strongyles are threadworms of the genus *Strongylus*. Results indicated that the effectiveness of the chlorinated hydrocarbons was due in greater measure to their volatility rather than to their water solubility. A study of the action of urea on the eggs of horse strongyles showed that the chemical as such is not harmful to the eggs. In the presence of feces, however, the urea is changed into ammonium hydroxide which is lethal.

With regard to the researches on the use of dyes in the removal of tapeworms from chickens, it was found that brilliant green may be effective in this respect. The compound is very toxic, however, and further work will show whether smaller doses will be safe and efficient. Experiments were also carried out with the following dyes, with results indicating that they would be of little or no use for the removal of poultry tapeworms: gentian violet, azamine, rose bengal, magdala rose, brilliant cresyl blue, dahlia, mercurochrome, and auramine O. One of the sections of the biochemic division investigates the relationship between the chemical structure and the parasiticidal power of various compounds. Recent investigation in the field of anthelmintics have pointed to compounds of antimony which appear to have a specific toxicity to gapeworms in poultry. These worms cause a malady which is characterized by obstruction in breathing. The compounds, of which the double tartrates of antimony and other metals are other examples, are made into a fine dust which is inhaled by the fowl.

An important phase of the research work of the Bureau concerns studies on the nutritive value of the proteins of different animal tissues. Workers at the Bureau prepared a review of existing knowledge in this field and it was presented, by request, at the spring 1936 meeting of the American Chemical Society. Very recent feeding experiments with albino rats have demonstrated that the proteins in calf lungs and in hog spleens were lower in nutritive value than those contained in lean beef. Calf lungs, however, were found to be a moderately good source of the Vitamin G complex. The digestibility and growth-promoting properties, in albino rats, of various fats such as lard, oleo oil, peanut oil, and cottonseed oil, were studied. No significant relation was observed between a chemical constituent of a fat and its nutritive qualities.

The Bureau of Animal Industry employs a total of forty chemists

who are distributed among the grades as follows: one principal chemist, six senior chemists, two chemists, ten associate chemists, eight assistant chemists, and thirteen junior chemists. It must, however, be noted that these figures, and corresponding data for other Government Agencies are subject to change through additions of personnel, transfers, resignations, promotions, retirements, etc.

Bureau of Plant Industry

The Bureau of Plant Industry is another subdivision of the Department of Agriculture in which chemists are employed. The Bureau is primarily a research organization, its regulatory activities being confined to enforcement of the Federal Seed Act. Its main function is to find solutions for the many problems of the plant industries. One of these problems has to do with the breeding of plants to produce strains having greater resistance to disease, insect pests, or other adverse conditions. For example, a new variety of wheat developed in the Bureau withstood remarkably well the severe epidemic of stem rust which occurred in the 1935 wheat season. Many of the older varieties, less resistant to the stem rust disease, were failures, causing losses amounting to many millions of dollars. Similarly, breeding experiments on corn have produced certain hybrids which yield an average of twelve to twenty-six per cent more than good local varieties of open pollinated corn. The seed of these and other promising varieties of plants, are released to the trade. By this means, the effects of the Bureau's researches on plant breeding and plant disease prevention, find vast practical application. A good part of this, and other work done by the Bureau, requires the services of men with chemical training.

One of the divisions of the Bureau, that dealing with cereal crops and diseases, has investigated the problem of selenium toxicity. Its recent experiments have confirmed earlier work which showed that the absorption of selenium by plants growing on selenized soil was retarded by the addition of sulphur. These two elements are related chemically, and appear in the same column of the periodic table. The suggestion was therefore advanced that similar relationships might hold for other toxic elements and nontoxic elements related chemically. Indeed, it was shown that calcium prevented strontium injury to plants. It was also found that phosphorus prevented arsenic injury, and potassium prevented rubidium injury. These experiments

were carried out on plants kept in nutrient solutions. The Division also investigated the power of sodium chlorate to control bindweed. Its effectiveness in this respect was found to vary with the soil type. Further observations disclosed that the subsequent crops grown on fields treated with sodium chlorate were injured by the chemical.

The Division of Drug and Related Plants of the Bureau requires the services of biochemists. The functions of this division are to isolate and study those toxic compounds from plants which are poisonous to grazing animals. The biochemists also do work on the selection and breeding of cultivated drug plants in order to develop new strains with higher yields. They conduct researches on oil-producing plants to find more efficient methods for extraction of the oils which are so widely used in the paint and varnish industries. Those plants which find use in the production of perfumes also engage their attention. The recent investigations of the Division have been directed toward the search for insecticides which are harmless to humans. Pyrethrum flowers are an example of this type of insecticide. These flowers, which are obtained largely from Persia and Western Asia, have long been known to be toxic to cold blooded animals like insects. The division is engaged in working out methods which will make possible the domestic cultivation of these pyrethrum flowers. Sixteen test plots, in various sections of the country, were planted. The yield per acre of dried pyrethrum flowers ranged from one hundred to one thousand pounds, and tests, designed to compare their insecticidal power with commercial imported varieties, showed that some of the domestic flowers compared favorably with the imported ones. However, there remain certain obstacles to commercial pyrethrum growing in this country, and these the division is striving to overcome. This work illustrates one of the important functions of the Bureau: that of introducing into this country new and promising plants, obtained from foreign sources, for the purpose of studying the possibilities of their domestic cultivation. In one year, more than five thousand economic and ornamental plants were brought into the United States. The Bureau maintains a plant introduction garden at Coconut Grove, Florida, where the cultivation of exotic plants like the rubber vine of Madagascar is attempted.

The division dealing with investigations of soil fertility has studied the effectiveness of zinc in controlling the disease known as pecan rosette. It was found that when zinc was added to soils which were

basic, the metal became unavailable, and therefore incapable of preventing the disease. In acidic soils, however, the zinc was effective.*

Another series of experiments conducted by the Soil Fertility Investigations Division, has centered upon the effects of adding high-nitrogen fertilizer mixtures to new varieties of sugarcane. These experiments proved that the addition of the fertilizer produced an increase of approximately twenty tons of sugarcane and three thousand three hundred pounds of sugar per acre. This impressive increase will probably make it a general practice to add the fertilizer to sugarcane crops.

The division which investigates sugar plants, has studied a non-parasitic disease of sugar beets which is characterized by a dwarfing and necrosis of the center leaves. The condition was found to be caused by a deficiency of boron in the soil. The addition of borax, to the extent of ten to twelve pounds per acre, was effective in controlling the disease.

Another division of the Bureau which utilizes the services of chemists, is the one dealing with tobacco investigation and plant nutrition. One of the men in this division, who has done some fundamental work in the study of the relation of light to plants, is a plant physiologist whose early training was in the field of chemistry. His investigations showed that a certain unreproductive plant readily flowered and set seed when the period, during which it was exposed to light, was changed. Further work showed that changing the duration of the daily light period either induced or suppressed reproductive activity of many other plants. The light period also greatly affected such factors as the formation of tubers, leaf development, and branching and growth of the main stem. Different plants were found to differ greatly in their day-length requirements. A recent publication on this outstanding problem of plant physiology, appeared in volume fifty-two, page nine hundred and forty-three, of the *Journal of Agricultural Research*. It deals with the response of certain plants to length of day and temperature under controlled conditions.

Some of the past work of the division concerned the effects which different nutrients and fertilizer materials had on plants. Breeding experiments were carried out on different types of tobacco with the object of developing strains having a low nicotine content. Studies

*The publications which describe this work appear in volume forty-one of *Soil Science*, page 329, and in volume eight of the Analytical Edition of *Industrial and Engineering Chemistry*, page 97.

were also made of the chemical changes which take place in the curing and fermentation processes of tobacco. One of the recent researches of the division was undertaken to find a method of controlling the mildew disease of tobacco. It was found that the slow evaporation of pentachlorethane was successful in controlling the disease even after it had been allowed to develop extensively. This work was carried out in a large greenhouse at the Arlington Experiment Farm of the Bureau. Two units of the greenhouse, which contained plants afflicted with the disease, were treated with measured amounts of the chemical, and a third unit, used as a control, remained untreated. The mildew was quickly arrested in the two treated units, while in the untreated one, the disease continued active.

Many other practical experiments, which can be carried out under controlled conditions, are undertaken at the Arlington Experiment Farm at Arlington, Virginia, near the District of Columbia. In addition, the Bureau maintains a horticultural farm at Beltsville, Maryland, and in nearly all of the major crop producing regions of the country, the Bureau's field stations and laboratories work on the problems affecting the local plant industries. For example, the Division of Tobacco and Plant Nutrition maintains field stations and laboratories in Wisconsin, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Tennessee, and Georgia. However, most of the chemical work of the Bureau is done in Washington, D. C.

The Bureau of Plant Industry employs a total of thirty-six chemists and biochemists. They are distributed among the grades as follows: one principal biochemist, five senior chemists, two chemists, eight associate chemists, thirteen assistant chemists, and seven junior chemists. In addition, many of the other research workers of the Bureau are men who have had considerable chemical training.

Bureau of Entomology and Plant Quarantine

Another subdivision of the Department of Agriculture, the Bureau of Entomology and Plant Quarantine, is devoted to a study of insect pests and plant diseases. While chemistry is a necessary tool in the development of products which will kill harmful insects and control or eradicate plant diseases, most of the work is done by entomologists and plant quarantine inspectors. These men see to it that foreign insect pests or contraband plants are denied admission into the country through the various ports of entry. Those that have gained a foothold here, the Bureau attempts to restrict by throwing around

the affected areas a *cordon sanitaire*. In view of the fact that, in many instances, it is impossible to raise a successful crop without the application of insecticides, the vital importance of the Bureau's work is easily apparent.

Most of the chemistry work of the Bureau is done in the Division of Insecticide Investigations which is headed by a principal chemist. In one year, forty-three publications, embodying the results of the researches of the division, appeared in various scientific journals. One of the problems investigated dealt with the isolation of the two pyrethrins which are the active constituents of pyrethrum powder. This work has not yet been completed, but sufficient data has accumulated to indicate that the structural formulas heretofore accepted for the two pyrethrins are incorrect. Two new formulas were proposed which appear to explain satisfactorily all of the recorded reactions of the compounds. A paper by two chemists of the Division, which appeared in the *Journal of the American Chemical Society*, volume 58, page 1777, discusses the structure of pyrethrolone, one of the constituents of pyrethrum flowers.

The division recently produced certain nicotine dusts which were designed to give off the chemical rapidly, thus producing a high concentration. The product is useful in the control of pea aphids and other insects. In connection with this work, a new microanalytical method was developed for the determination of small quantities of nicotine which is a vegetable alkaloid and a beta-substituted derivative of pyridine.

A different field of investigation in insecticide work is carried out by a section devoted to the production of synthetic organic chemicals. For example, the following compounds were found to be toxic to mosquito larvae when present to the extent of five parts per million or less: phenothioxindibenzothiophene, thioxanthydrol, dibenzofuran 2-chlorodibenzofuran, 2-aminodibenzofuran, 2-methylanthraquinone, *p*-chlorodiphenyl, and others. These diverse compounds afford an illustration of the fine type of synthetic work done by the division. Many azo compounds were prepared, and their toxicity to insects determined. It was found that while some of the azo compounds are useful against mosquito larvae, none of them seem promising against other insects. The division is attempting to find a satisfactory organic substitute for the poisonous lead arsenate which is used in spraying apples. It was found that, of all the compounds studied, phenothiazine is the most promising in this respect, and its properties and

those of its derivatives are being fully determined. As an adjunct to the work of preparing synthetic organic chemicals for use as insecticides, studies were carried out to find the fundamental relationships existing between toxicity and chemical structure. For example, using goldfish as the subject material, the toxicity of phenol was compared with that of thiophenol. As was to be expected, the substitution of sulphur for oxygen made the latter compound about six times more toxic than the former. The three isomeric cresols were then studied and it was found that the ortho and para compounds were appreciably more toxic, and the meta compound slightly less toxic than phenol itself. Thus the positions of the substituent groups appear definitely to influence the toxicity of compounds. This important line of research is, of course, still going on.

The study of inorganic insecticides is carried out in another laboratory of the division. The recent work of this laboratory has involved phase-rule studies of the system CaO, As_2O_5, H_2O. Commercial samples of calcium arsenate were shown, by x-ray studies, to contain, in the basic region, tricalcium arsenate and tetracalcium arsenate with a continuous series of solid solutions between them. The laboratory also carried out a survey of the paris greens on the market, samples of the products being analyzed chemically and physically. The bibliographies of two other arsenical insecticides of minor importance, magnesium arsenate, and manganese arsenate were compiled.

A different field of investigation in which the division is interested, concerns methods for the removal of insecticidal spray residues from fruits. In the laboratories at Yakima, Washington, and Washington, D. C., more than one thousand five hundred analyses of lead in fruits were made in one year. The work demonstrated that the regular acid wash for the removal of lead arsenate residues could be made more efficient by the addition of one per cent of a low viscosity mineral oil. The analyses of one lot of apples showed the unwashed fruit to have an average lead content of 0.256 grain per pound, while in the washed fruit, the average was 0.0392, showing a reduction in the lead content of about 85 per cent.

The division carried out many analyses of inorganic chemicals used for the control of bark beetles which attack trees. Copper sulphate, zinc chloride, sodium arsenate, and mercuric chloride are employed for this purpose, and in order to find out just how the various chemicals spread throughout the trees, eight hundred samples of wood from trees injected with copper sulphate, were tested for copper, and three hundred samples each of wood from trees injected with

either zinc chloride, sodium arsenate, or mercuric chloride, were analyzed respectively for zinc, arsenic, and mercury. Investigations were carried out on oil emulsions used as insecticides. It was attempted to increase their effectiveness by incorporating other toxic materials into the oil sprays, and it was found that of eight materials tested for the purpose, nicotine and lauryl thiocyanate showed definite promise. In studying the oils themselves, it was found that petroleum oil emulsions were definitely superior, in insecticidal power, to emulsions prepared from vegetable oils.

The Bureau of Entomology and Plant Quarantine utilizes the services of one principal chemist, four senior chemists, four chemists, ten associate, five assistant, and ten junior chemists.

F. K. Bezzenberger

THE AMERICAN INSTITUTE OF CHEMISTS has just been informed of the death of F. K. Bezzenberger in July, 1939. Mr. Bezzenberger was born in O'Fallon, Missouri, and was educated at St. Louis University. He received the M.A. degree from Harvard University in 1916, during four years of post-graduate study and teaching at that University. From 1918 to 1920 he served as chief research chemist with the Aluminum Castings Company. From 1920 until his death he was president and technical director of the Cosma Laboratories Company of Cleveland, Ohio. During the war he was in charge of developing large scale processes for the manufacture of war gases for the Army. He patented numerous metallurgical and mechanical processes, and served as technical expert in numerous court cases of industrial importance.

He became a fellow of THE AMERICAN INSTITUTE OF CHEMISTS in 1937.

Joseph John Kalisz

THE AMERICAN INSTITUTE OF CHEMISTS regrets to record the death of Joseph John Kalisz on September 15, 1939.

Mr. Kalisz was born February 4, 1915, in Adams, Massachusetts. He studied at the University of Alabama in the School of Chemistry, Metallurgy and Ceramics, and received the B. S. degree in 1937. He was employed by the U. S. Department of Agriculture at Greenfield, Massachusetts, in a campaign to exterminate the gypsy moth. He became a Student member of THE AMERICAN INSTITUTE OF CHEMISTS in 1936.

COUNCIL

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President, Robert J. Moore
Vice-President, J. W. E. Harrisson
Secretary, Howard S. Neiman
Treasurer, Burke H. Knight

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Lloyd Van Doren
Gerald Wendt

CHAPTER REPRESENTATIVES

New York	*Niagara*	*Philadelphia*	*Washington*
Charles A. Marlies	A. W. Burwell	Gilbert E. Seil	Albin H. Warth

December Meeting

The one-hundred and sixty-sixth meeting of the Council of The American Institute of Chemists was held on December 12, 1939, at The Chemists' Club, 52 East 41st Street, New York, N. Y.

President Robert J. Moore presided. The following officers and councilors were present. Messrs: D. H. Andrews, R. A. Baker, B. H. Knight, H. G. Knight, C. A. Marlies, R. J. Moore, H. S. Neiman, W. T. Read, G. E. Seil, N. A. Shepard, and F. D. Snell. Mr. M. R. Bhagwat, Dr. W. D. Turner, and Miss V. F. Kimball were present.

The minutes of the preceding meeting were approved.

The Treasurer's report showing a bank balance as of December 12, 1939, of $4056.01, with bills payable of $284.33, was read and accepted.

The Secretary was instructed to prepare a list of the names of those who are deliquent in the payment of dues for the next council meeting.

Dr. Read reported progress and plans for the membership committee.

The following new members were elected:

FELLOWS

Acree, Salomon F.
(1939), *Section Chief,* National Bureau of Standards, Washington, D. C.

Bashour, Joseph T.
(1939), *Research Chemist,* College of Physicians and Surgeons, 630 West 168th Street, New York, N. Y.

Brown, Joseph T.
(1939), *Dean of Chemistry,* St. Joseph's College, Philadelphia, Penna.

Compton, Jack
(1939), *Research Chemist,* Boyce Thompson Institute for Plant Research, Yonkers, New York.

Irion, O. E.
(1939), *Chemist,* General Printing Ink Corporation, New York, N. Y.

Jacobus, David D.
(1939), *Assistant Professor,* Stevens Institute of Technology, Hoboken, New Jersey.

Kimball, C. S.
(1939), *Associate,* Foster D. Snell, Inc., Brooklyn, N. Y.

Layng, Edwin T.
(1939), *Research Chemist,* M. W. Kellogg Company, Jersey City, N. J.

Mehlenbacher, V. C.
(1939), *Charge of Eastern Laboratories,* Swift and Company Refinery, Newark, New Jersey.

Miller, Pharis
(1939), *Research Chemist,* Standard Oil Development Company, Linden, New Jersey.

Niederl, Joseph B.
(1939), *Associate Professor,* New York University, New York, N. Y.

Simmons, E. J. H.
(1939), *Research Chemist,* College of Physicians and Surgeons, 630 West 168th Street, New York, N. Y.

Steffens, Carsten
(1939), *Chemist,* General Printing Ink Corporation, New York, N. Y.

Swenson, T. Lowell
(1939), *Director of Laboratory,* Western Regional Research Laboratory, U. S. Department of Agriculture, Albany, California.

Tallman, Ralph C.
(1939), *Director of Research,* Schieffelin and Company, 16 Cooper Square, New York, N. Y.

Taub, Abraham
(1939), *Associate Professor,* College of Pharmacy, Columbia University, New York, N. Y.

Treacy, C. S.
(1939), *Chemist,* Merck Chemical Company, Rahway, N. J.

Wells, Lansing S.
(1939), *Chief,* Lime and Gypsum Section, National Bureau of Standards, Washington, D. C.

Winninghoff, W. J.
(1939), Lamp Department, General Electric Company, Hoboken, N. J.

ASSOCIATES

Blann, William A.
(A.1939), *Research Chemist,* American Cyanamid Company, Stamford, Connecticut.

Shea, Thomas Emmett, Jr.
(A.1939), *Graduate Student,* Laboratory of Public Health and Preventative Medicine, University of Pennsylvania, Philadelphia, Penna.

Turner, Jack
(A.1939), *Junior Chemist,* Industrial Farm Products, Department of Agriculture, Arlington, Virginia.

JUNIOR

Saffitz, Abraham A.
(J.1939), 265 Northland Avenue, Buffalo, New York.

Upon motion made and seconded, the Secretary was instructed to send a copy of the minutes of the National Council meetings to the Secretary of each chapter.

President Moore encouraged the use of the Institute key by members.

Upon motion made and seconded, Joseph J. Stubbs and Martin Leatherman were raised from Associates to Fellows.

Upon motion made and seconded, it was decided to publish the roster of the Institute in April instead of January.

The date of the next meeting of the

National Council was decided to be January 9, 1939.

The President appointed Charles A. Marlies as chairman of an "Inter-relations Committee" to act in conjunction with the Membership Committee.

Upon motion made and seconded, it was moved to accept the offer of the Pennsylvania Chapter to act as hosts for the next annual meeting, and it was suggested that the meeting place be Atlantic City. The Secretary was requested to write about this to the Pennsylvania Chapter.

The following new members were added to the Committe on Professional Education: Donald H. Andrews and Frank O. Lundstrom.

The standardization of chemistry degrees was referred to this committee.

The Washington Chapter announced that it will send notices of their meetings to the other chapters.

President Moore suggested that the Canadian Institute of Chemistry would like to keep in touch with the activities of the American Institute of Chemists.

The President announced that the eighth American Scientific Congress would be held in Washington, D. C., on May 10-18, 1940, in celebration of the Fiftieth Anniversary of the founding of the Pan-American Union.

There being no further business, the meeting was adjourned.

CHAPTERS

New York

Chairman, Harry G. Lindwall *Vice-Chairman,* Beverly L. Clarke

Secretary-treasurer, D. H. Jackson
17 John Street
New York, N. Y.

Council Representative, Charles A. Marlies

A meeting of the New York Chapter was held at The Chemists' Club, New York, N. Y., on January nineteenth. Dr. Walter S. Landis, vice-president of the American Cyanamid Company, spoke on "The Selection and Training of Executives for the Chemical Industry." Dr. Landis' talk appears on page 4 of this issue of THE CHEMIST.

Niagara

Chairman, Maurice C. Taylor *Vice-chairman,* F. W. Koethen

Secretary-treasurer, Alvin F. Shepard
90 Courier Boulevard
Kenmore, N. Y.

News Reporter to THE CHEMIST, Margaret C. Swisher

Council Representative, Arthur W. Burwell

Carl H. Rasch, *Alternate*

Washington

President, Frank O. Lundstrom

Vice-president, Albin H. Warth *Treasurer,* Philip A. Wright

Secretary, Martin Leatherman
9 Quincy Avenue, Hyattsville, Md.

News Reporter to THE CHEMIST, Alexander J. Stirton

Council Representative, Albin H. Warth

Executive Committee

J. R. Adams	H. C. Fuller	N. W. Matthews	W. H. Ross
M. S. Anderson	L. R. Heiss	J. W. McBurney	E. F. Snyder
A. P. Bradshaw	J. H. Hibben	A. L. Mehring	J. J. Stubbs
R. T. K. Cornwell	B. Makower	R. M. Mehurin	E. K. Ventre
P. R. Dawson	L. N. Markwood	A. R. Merz	C. W. Whittaker
R. B. Deemer		W. M. Noble	J. F. Williams

A LUNCHEON meeting of the Washington Chapter was held on Tuesday, January ninth, in the South Building of the Department of Agriculture. President Frank O. Lundstrom presided. About fifty members and guests were present.

After an excellent luncheon the meeting adjourned to a room more convenient to audience and to speakers.

The meeting approved a recommendation of the Student Medal Awards Committee to award medals in the eight universities in which they were awarded last year.

The Chairman of the Issues and Objectives Committee, A. L. Mehring, reviewed briefly some accomplishments of the INSTITUTE, past and pending. These are summarized:

The code of ethics.

A standard contract of employment.

A standard curriculum for the training of chemists.

Licensing program.

Assistance to unemployed chemists.

Organized efforts to improve the economic status.

The Student Medal Award.

Suggestions to the Reed Committee for improving Civil Service e.g. (1) preferred status on Civil Service rolls when dismissal occurs through lack of funds (2) thirty days notice before dismissal.

Mr. Mehring said that since the recommendations from the INSTITUTE were received by the Reed Committee, the Department of Agriculture has adopted a policy of placing employees who have been discharged for lack of funds and without prejudice on a preferential reëmployment register for a period of a year.

A questionnaire is being prepared to obtain information concerning the present status of members, with the purpose of formulating plans for improvement. Members will be asked to answer the questions, but not to sign their names, as the information will be for statistical purposes only.

Mr. Watson Davis, the director of Science Service, was introduced. He gave a very interesting talk on the subject, "The Public's Way to Science". A digest of it follows:

Taking science to the public through

various media is an important function. The scientific method is the successful democratic method. Some of this must be infused into our daily life.

Science Service started as a coöperation between newspapers and science. Formerly, whenever any large scientific meeting came to town, the city editor sent the nearest reporter down to get a story. The reporter was baffled by the big words and the strange new ideas. His story was quite unsuccessful in bringing science to the public.

Today this is not so true. The local reporter wants to do a creditable job and frequently he has a little science. Nowadays there are perhaps a score of leading scientific writers bringing science to the people through magazine articles, books and other channels.

Any important research can be presented to the public in a thrilling and accurate way. When a scientist declares his work is too abstruse to be popularized, the challenge is immediately accepted by the writer.

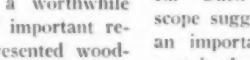
Part of the technique in presenting science to the public is to keep in the article some of the emotion and enthusiasm which the scientist must have felt and which we all feel in doing a difficult job in a worthwhile manner. The results of important research should not be presented woodenly, if they are to be read and understood. Good photography helps popularization.

Radio, books, and moving pictures are good fields in the popularization of science. More recent possibilities are (1) the use of phonograph records to preserve the personality of eminent scientists and (2) the use of miniature exhibits of actual materials such as Nylon and other artificial fibres for people to hold and to see.

Relatively new methods have great possibilities in the dissemination of scientific results to scientists. The Bibliofilm Service is a pioneering venture which now is quite practical at the rate of one cent a page. The Auxiliary Publication Service permits the availability of a large mass of data which cannot be published through ordinary means because of space restrictions. Thus, to use this method the author submits the whole of his manuscript to his editor who publishes a short technical report. The more complete material is deposited with the American Documentation Institute, from whence it is available through Bibliofilm Service.

The "World Brain" is the goal beyond these services and methods and it is far from realization. It is conceivable that by the intelligent use of the microfilm, sorting devices, and other tools yet to be made a gigantic inclusive abstract center may be created. Such a concept of international scope suggests that scientists may take an important and not a self-effacing part in the world and make themselves useful with their expert opinion.

The excellent address of Mr. Watson Davis was well-received. President Lundstrom thanked him on behalf of the Chapter and the meeting was declared adjourned.



Dr. Harry Fisher, F.A.I.C., of the U. S. Industrial Alcohol Company, will speak at the meeting of the Pennsylvania Chapter to be held January 30, 1940, in Philadelphia.

E. I. du Pont de Nemours and Company announce that twenty-six post graduate fellowships for research in chemistry will be awarded in 1940-41.

Pennsylvania

Chairman, Walter L. Obold *Vice-chairman,* A. C. Angus

Secretary-treasurer, Harry C. Winter
The Biochemical Research Foundation
133 South 36th Street
Philadelphia, Penna.

Council Representative, Gilbert E. Seil

News Reporter to THE CHEMIST, Kenneth A. Shull

NORTHERN LIGHTS

***By* Howard W. Post, F.A.I.C.**

"Although Canada's war machinery has been set in motion, it is, as yet, travelling only in low gear, but as the pace accelerates, steady hands, clear brains and iron nerves are going to be necessary to steer the nation safely through to its ultimate destination."—C-I-L, *Oval,* December, 1939.

It is stated that Belgian interests are arranging now for the processing, in Canada, of ore from the Congo which ordinarily would be treated in Belgium. The perils of the North Sea mine barrage are too great.

It is becoming more clearly understood that, in addition to the material requirements of Canada's Forces, very large supplies will also be needed from Canada to supplement production in Great Britain and other parts of the Empire. It is in recognition of these anticipated requirements for skilled workers in industry that the Department of National Defence has issued instructions to recruiting officers providing that skilled tradesmen are not to be enlisted in a military unit except in the classes and then only in the numbers required by the particular unit establishment. It is provided that every effort must be made to place men in those corps for which they are best adapted by their civil vocations.

From a recent number of *Canadian Chemistry and Process Industries,* " . . . competent chemists and chemical engineers are now officially attached to the Purchasing Supply Board and to missions representing overseas interests. Joint offices for British and French Missions have been opened in New York. Chemists and manufacturers will be able to consult with technical representatives of the Board on any matter, with the full knowledge that their language will be understood and their business problems appreciated. Considering the zero start and the lack of permanent military establishments on the grand scale, much is being done, and by comparison, progress may be measured as excellent or only fair in accordance with the point of view of the individual."

THE SCIENCE ANGLER

Kenneth E. Shull, J.A.I.C.

About ten years ago it was discovered that the presence of more than 0.0001 per cent. of fluorine in drinking water was enough to cause endemic mottled enamel. Immediately methods were developed for the removal of this element, and some proved to be quite successful.

Recently, however, experiments have indicated that a complete lack of fluorine in the diet may predispose one to dental caries. The result is that certain "experts" are now advocating the addition of controlled amounts of fluorides to public water supplies and to milk.

To which we add, as did a sage of years gone by, "Two things are bad: 'too much', and 'too little'".

Chemists have long been trying to produce a synthetic which would rival the diamond in hardness. To our knowledge, the nearest approach to this is a compound recently obtained by subjecting a mixture of tungsten, titanium, and carbon to a temperature of 2000°C in a graphite crucible.

The final product is only 0.2 of a point on Moh's scale away from the goal.

The normal function of the lungs is to supply oxygen to the blood and to take from it carbon dioxide and other waste products. For most people, however, they serve also as a storage room for certain products of the destructive distillation of tobacco.

It has been shown that the lungs of the average smoker (how few of us are free from this so-called evil) become lined with approximately eight quarts of tobacco tar during a period of ten years of "puffing ones cares away".

Women are more prone to "blow hot and cold with the weather" than are their male contemporaries. This applies not only to a zig-zagging of ideas but also to an actual difference in skin temperature.

Thus it has been shown that women do not begin to perspire until their skin temperature is a few degrees above the threshold for sweating in men; and the amount of perspiration is less. As a result of this, woman's skin temperature is higher than man's in a warm atmosphere and correspondingly lower in a cold one.

The oft heard statement, "He has been poisoned by arsenic", is really not true at all. Contrary to popular belief the element arsenic is itself non-poisoness. In the form of its compounds, however, it *does* prove to be quite effective in relieving one of worldly cares.

According to authoritative sources a single bubble of pure arsine gas has been known to prove fatal.

And speaking of poisons—tests have recently been made to learn just how great a concentration of chlorine gas can be endured without causing physical harm.

From the results obtained it is evident that a brief exposure to 1 part of chlorine in 1000 parts of air will rapidly prove fatal. Even a concentration of 1 part of the gas in 100,000 parts of air will, after an hour, produce a bronchitic condition.

CHEMISTS

The International Congress of Mathematicians, scheduled to be held in Cambridge, Massachusetts, in September, 1940, is indefinitely postponed.

Dr. Henry G. Knight, F.A.I.C. chief of the Bureau of Agricultural Chemistry and Engineering, announces the appointment of Dr. C. H. Kunsman as chief of the Physiochemical and Analytical Division of the Department's Western Regional Research Laboratory at Albany, California. This Western Laboratory deals with the industrial utilization of such farm commodities as wheat, fruits and vegetables, Irish potatoes and alfalfa.

Foster Dee Snell, F.A.I.C., addressed the Connecticut Valley Section of the American Chemical Society on January thirteenth at Springfield, Massachusetts. His subject was "Some Factors in Detergency". Dr. Snell outlined the four factors which so far as known control the efficiency of a detergent and showed their applications in many types.

New Textile Merchandising and Marketing Course

H. R. Mauersberger, in charge of the Evening Textile Courses at Columbia University, wishes to announce the addition of a new course on the subject of "Merchandising and Marketing of Textiles" to be given next Fall by Dr. S. J. Kennedy, director of Market Research of Pacific Mills.

The course will include a study of the problems dealt with by the textile merchants or the executive in charge of merchandising, and is recommended to those training for junior executive merchandising positions in textile companies.

The course consists of fifteen lectures and will be given on Tuesday evenings from 7:30 to 9:30 P.M. For further information address the Registrar of Columbia University, 116th Street and Broadway, New York, N. Y.

Columbia Evening Textile Courses

H. R. Mauersberger, who is in charge of the Evening Textile courses at Columbia University, announces that the following courses, beginning about February seventh, will be given during the spring session:

Identification, Analysis and Testing of Textiles (advanced).
Converting of Rayon and Spun Rayon Fabrics.
Textile Chemistry.
Cotton Goods Converting.
Woolen and Worsted Manufacture.
Advanced Woven and Printed Fabric Design.

These courses extend for a period of fifteen weeks and are open to all without entrance examination. Registration begins Monday, February fifth. Instructors may be consulted during the registration period from seven to nine p. m. in Room 301, School of Business Building, northeast corner of 116th Street and Broadway, New York. All inquiries should be addressed to the Director of University Extension, Columbia University.

BOOKS

FERMENTE, HORMONE, VITAMINE. By Robert Ammon and Wilhelm Dirscherl. *Georg Thieme Verlag*, Leipzig, 1938. 450 pages. Export price: 24 Marks.

This is an excellent book dealing with ferments, hormones, and vitamins, their problems and solutions. Although the book was prepared less than two years ago, rapid progress in the fields of chemistry and biology has rendered this book somewhat out of date. It should, however, be classified as a valuable reference book.

—Rudolf Seiden

SCIENCE TODAY AND TOMORROW. by Waldemar Kaempffert. The Viking Press, 1939. 275 pages. $2.50.

This is a wholly popular account of some of the potentialities of the work of science, by the science and engineering editor of the *New York Times*, who states that "the task of a vulgarizer of science is no longer confined to mere elementary exposition of principles and procedures. He must indicate, as best he can, what effects new discoveries and inventions are likely to have on individual and community life. Indeed, a whole literature on what is called 'the impact of science on society' has been produced within the last decade."

The book contains eighteen essays written in a conversational, non-technical style. The chapters on "The Birth and Death of the Moon" and "Rocketing through Space", though technically logical, remind one of the fantasies of H. G. Wells and Jules Verne, so vivid is the description of man's participation in these future events. "The Chemical Revolution" discusses the synthetic possibilities and achievements of chemistry. Among the other chapters, three consider "Can the Laboratory Create Life", "Evolution since Darwin", and "Carrel".

Mr. Kaempffert is especially interested in the impact of scientific discoveries upon the social order, and the concluding chapter is devoted to a consideration of the position of scientific freedom in a democracy, where authority must be willing to recognize and to accept new scientific accomplishments for the good of society. This final chapter should make scientific men more conscious of the effect of their achievements upon social evolution.

—V. F. Kimball.

Cyril S. Kimball, F.A.I.C., spoke before the student branch of the American Institute of Chemical Engineers, at Cooper Union on December twentieth, on the subject, "A Short Trip around a Consulting Chemical Laboratory". He discussed the diversified problems of the consulting chemist, giving illustrative stories to bring out his points.

Civil Service examinations will be held for position of X-Ray Crystallographer, $2600. Applications should be filed with U. S. Civil Service Commission, Washington, D. C. by February 12th from Eastern States or February 15th from far Western States. Application forms may be obtained from first-class Post Offices or the Commission.

EMPLOYMENT

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RESEARCH - DEVELOPMENT CHEMIST, F.A.I.C., M.S. (M.I.T.) Organic Chemistry. Ex-chief chemist forced to change by conditions beyond his control. Well qualified by sufficient training and fifteen years (in good positions) in chemicals, latex, gases, and patents. Best personal and professional references. Complete details for confidential consideration. Available now. Please reply to Box 11, THE CHEMIST.

FOOD AND DRUG CHEMIST, F.A.I.C., Ph.D. Formerly superintendent of manufacture of drug products; teaching experience in food and drug analysis; consultant on food and drug labels. Chief chemist in brewing manufacture; bacteriology and research on methods in brewery. Successful in handling men. Has published twenty-two papers. Listed in *American Men of Science*. Expert witness in court cases. Please reply Box 123, THE CHEMIST.

BIOCHEMIST, F.A.I.C., A.M. degree. Several years' experience in protein research. Particularly interested in the practical utilization of proteins from by-products. Please reply to Box 111, THE CHEMIST.

METALLURGICAL ANALYST, F.A.I.C. Long experience in analysis of iron, steel, ferrous and non-ferrous alloys. Can take charge of laboratory. Please reply to Box 113, THE CHEMIST.

BIOLOGIST. B.A. degree 1939. Seeking position as laboratory assistant. Knows French and Swedish. Summer experience with Marine Biological Laboratory. Please reply to Box 121, THE CHEMIST.

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CHEMISTS or chemical engineers with three to ten years of experience in organic work to act as research assistants in organic research.

For these positions, please reply to Box 10, THE CHEMIST.

To New Year's Eve.

Good night! The goddess Night bids thee farewell,
Approaching day doth break the darkest spell
Of her deep mystery. The million eyes
That watched us through her cowl'ed face
Are closing one by one. Their vigil ends,
And e'en the moon reveals no trembling trace.

Good day! The dawning day with welcoming arms
Doth quiet our fears and still our soul's alarms.
She rises from her sleep with dew-wet hair,
And casts aside her mantle of the mist;
Her face aglow, with laughter in her eyes,
And rosy lips the morning sun has kissed.

Good night! May all thy dreams be calm and sweet;
May all thy visions be so far complete
That when the morning says to thee, arise!
The fairies' kiss will linger on thine eyes.

Good day! May every hour that wings its way
Bring thee sweet happiness throughout the day;
May Fate thy fondest wishes understand
And fortune ever lead thee by the hand.

Good night! Good day!
And thus I pray
That all God's goodness may be thine through life;
And when the last deep darkness ends the strife
May all be right.
Good day! Good night!

Howard Seger Neiman, F.A.I.C.

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1120 **Acid Nitric,** *C.P., Specific Gravity 1.42, A.C.S.*
1121 **Acid Nitric,** *Fuming, Reagent, Specific Gravity 1.49-1.50*
1191 **Acid Sulfurous,** *6% Solution, Reagent, A.C.S.*
1540 **Calcium Carbonate,** *Powder, Low in Alkalies, Reagent Special, A.C.S.*
1682 **Dextrose,** *Anhydrous Powder, Reagent*
1729 **Ferric Ammonium Sulfate,** *Crystal, Reagent, A.C.S.*
1787 **Hydrogen Peroxide,** *3% Solution, Reagent*
2088 **Potassium Bichromate,** *Crystal, Reagent, A.C.S.*
2105 **Potassium Chromate,** *Crystal, Reagent, A.C.S.*
2120 **Potassium Iodide,** *Crystal, Reagent, A.C.S.*
2179 **Silver Nitrate,** *Crystal, Reagent, A.C.S.*
2227 **Sodium Carbonate,** *Anhydrous, Reagent, A.C.S.*
2255 **Sodium Hydroxide,** *Pellets, Reagent, A.C.S.*

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